Arm® Cortex®-M4F SoC

32-bit Microcontroller

NT-I941

User Manual

Evaluation Board for I94100 Series

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1 OVERVIEW

The NT-I941 is an evaluation board for Nuvoton I94124ADI series microcontrollers. The NT-I941 is designed for project evaluation, prototype development and validation with power consumption monitoring function.

NT-I941 is with NAU88C22 on board to support MIC, AUXIN and headphone. User can use it to develop and verify the audio application program easily.

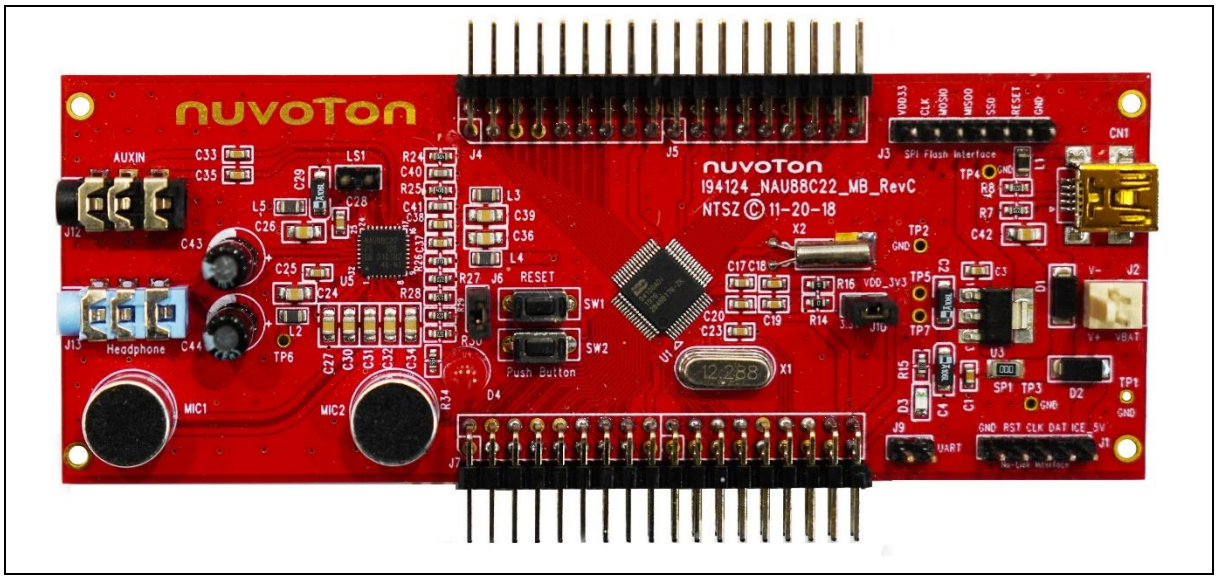


Figure 1-1 NT-I941 Evaluation Board

2 FEATURES

- Nu-Link ICE interface connector.
- Audio board extension interface connectors.
- USB 1.1 Full-Speed Device.
- Two push-buttons: one is for reset and the other one is for user-defined.
- Two LEDs: one is for power indication, the other one is for user-defined.
- Two MIC and two AUXIN input and headphone output through NAU88C22.
- Speaker and headphone output through NAU88C22.

3 HARDWARE CONFIGURATION

3.1 Front View

Figure 3-1 shows the main components and connectors from the front side of NT-I941. The following lists components and connectors from the front view:

- Target Chip: I94124ADI (U1)
- Nu-Link interface (J1)
- IO extension interface connectors (J4, J5, J7 and J8)
- USB: USB connector (CN1)
- Push-buttons (SW1, SW2)
- LED: POWER LED (D3, green), User Application LED (D4, red)
- Power connectors (J1, J2, CN1, J10)

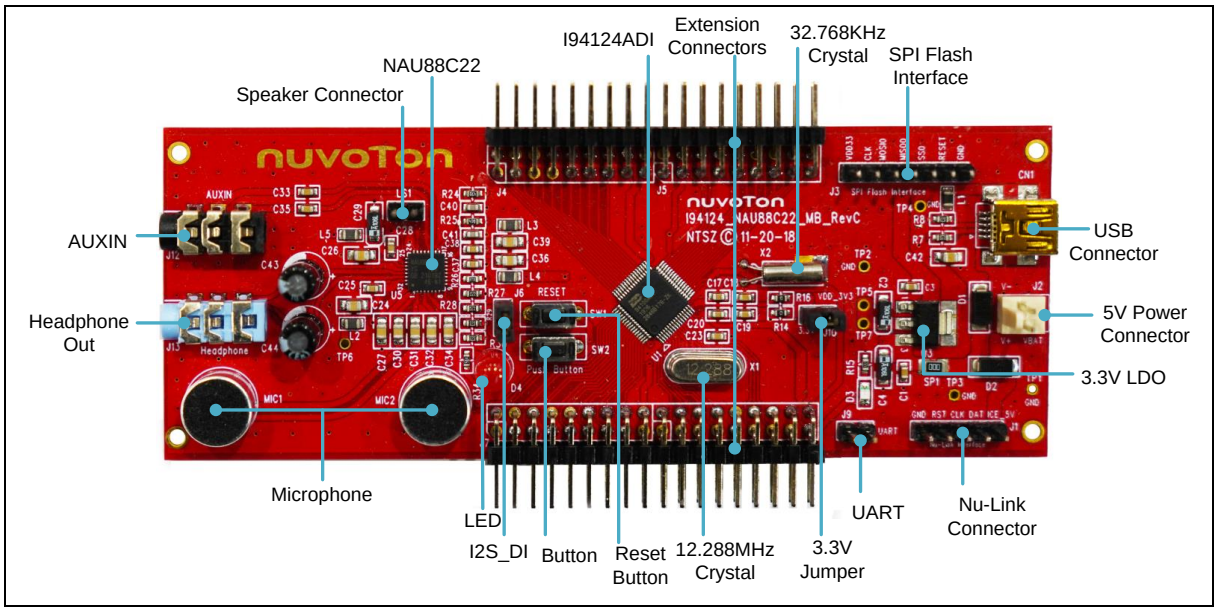


Figure 3-1 Front View of NT-I941

3.2 Rear View

Figure 3-2 shows the main components and connectors from the rear side of NT-I941.

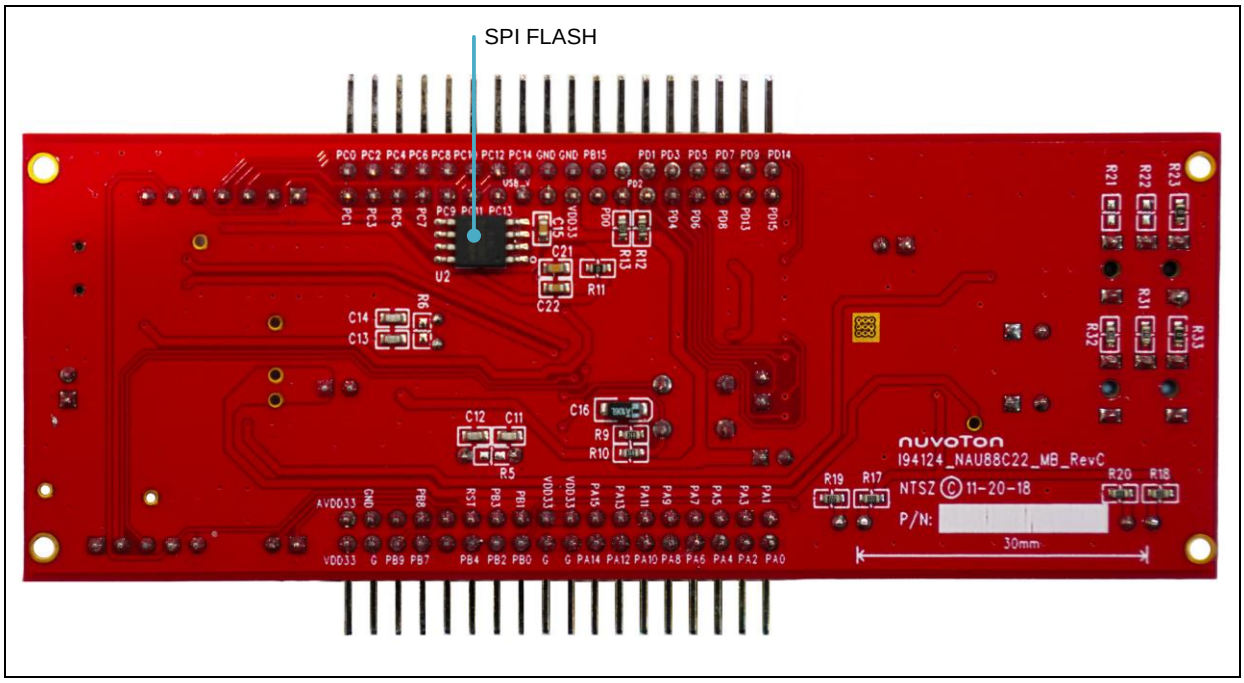


Figure 3-2 Rear View of NT-I941

3.3 Extension Connectors

Table 3-1 presents the extension connectors.

Connector	Description
J4, J5, J7, J8	Pins extension connectors on the NT-I941.

Table 3-1 Extension Connectors

3.3.1 Pin Assignment for Extension Connectors

The NT-I941 provides the I94124ADI onboard and extension connectors (J4, J5, J7, J8). Figure 3-3 shows the extension connectors.

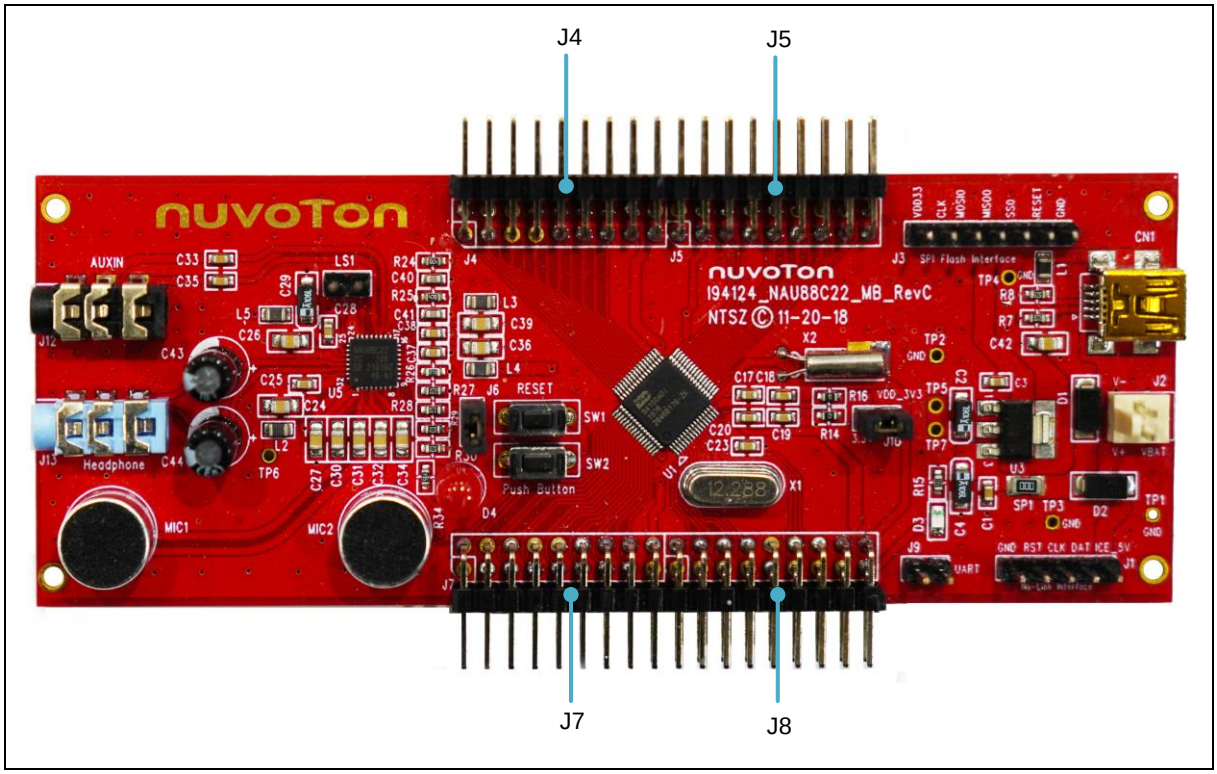


Figure 3-3 Extension Connectors

Header		NT-I941	
		Pin No.	Function
J4	J4.1	48	PD.15 / UART0_nRTS / EADC0_CH12 / I2C0_SDA / UART0_RXD / I2C1_SDA
	J4.2	47	PD.14 / UART0_nCTS / EADC0_CH11 / I2C0_SCL / UART0_TXD / I2C1_SCL
	J4.3	46	PD.13 / SPI0_SS1 / EADC0_CH0
	J4.4	45	PD.9 / ICE_DAT / TM0_EXT / I2C1_SDA / I2C0_SDA / DPWM_SP
	J4.5	44	PD.8 / ICE_CLK / TM0 / I2C1_SCL / I2C0_SCL / DPWM_SN
	J4.6	43	PD.7 / PWM0_CH5 / INT1
	J4.7	42	PD.6 / TRACE_DATA3 / SPI1_I2SMCLK / I2S0_BCLK / DMIC_DAT0 / DPWM_RP
	J4.8	41	PD.5 / TRACE_DATA2 / SPI1_SS / I2S0_DO / DMIC_CLK0 / DPWM_RN
	J4.9	40	PD.4 / TRACE_DATA1 / SPI1_CLK / I2S0_DI / DMIC_DAT1 / TM1
	J4.10	39	PD.3 / TRACE_DATA0 / SPI1_MISO / I2S0_LRCK / DMIC_CLK1 / TM2
	J4.11	38	PD.2 / TRACE_CLK / SPI1_MOSI / I2S0_MCLK / I2C1_SCL / TM0
	J4.12	37	PD.1 / INT4 / I2C1_SDA / I2C0_SDA / I2S0_LRCK / DPWM_LP
	J4.13	36	PD.0 / INT3 / I2C1_SCL / I2C0_SCL / I2S0_BCLK / DPWM_LN
	J4.14		NC
	J4.15		NC
	J4.16	33	PB.15 / USB_VBUS / I2S0_MCLK
	J4.17		VDD33
	J4.18		GND
J5	J5.1		VDD33
	J5.2		GND
	J5.3	32	USB_VDD33
	J5.4	31	PC.14 / PWM0_CH4 / I2C0_SDA / DPWM_SN
	J5.5	30	PC.13 / PWM0_CH3 / I2C0_SCL / DPWM_LP
	J5.6	29	PC.12 / SPI0_CLK / DPWM_LN
	J5.7	28	PC.11 / SPI0_MISO0 / PWM0_BRAKE1 / DPWM_RP
	J5.8	27	PC.10 / SPI0_MOSI0 / PWM0_BRAKE0 / DPWM_RN
	J5.9	26	PC.9 / SPI0_MISO1 / SPI2_I2SMCLK
	J5.10	25	PC.8 / SPI0_MOSI1 / SPI2_SS
	J5.11	24	PC.7 / SPI0_SS0 / SPI2_CLK
	J5.12	23	PC.6 / INT2 / SPI2_MISO
	J5.13	22	PC.5 / INT1 / SPI2_MOSI
	J5.14	21	PC.4 / PWM0_CH2 / CLKO / SPI1_I2SMCLK
	J5.15	20	PC.3 / I2C1_SMBAL / TM3_EXT / SPI1_SS
	J5.16	19	PC.2 / I2C1_SMBSUS / TM3 / SPI1_CLK

Header		NT-I941	
		Pin No.	Function
	J5.17		NC
	J5.18		NC
J7	J7.1	49	PA.0 / SPI0_SS1 / EADC0_CH0 / DMIC_DAT0
	J7.2	50	PA.1 / SPI0_MOSI1 / EADC0_CH1 / DMIC_CLK0
	J7.3	51	PA.2 / SPI0_MISO1 / EADC0_CH2 / DMIC_DAT1
	J7.4	52	PA.3 / SPI0_MOSI0 / EADC0_CH3 / DMIC_CLK1
	J7.5	53	PA.4 / SPI0_MISO0 / EADC0_CH4 / DPWM_LN
	J7.6	54	PA.5 / SPI0_CLK / EADC0_CH5 / DPWM_LP
	J7.7	55	PA.6 / SPI0_SS0 / EADC0_CH6
	J7.8	56	PA.7 / UART0_TXD / EADC0_CH7 / SPI2_MISO
	J7.9	57	PA.8 / UART0_RXD / EADC0_CH8 / SPI2_MOSI
	J7.10	58	PA.9 / I2C0_SCL / EADC0_CH9 / SPI2_SS
	J7.11	59	PA.10 / I2C0_SDA / EADC0_ST / DPWM_RN / SPI2_CLK
	J7.12	60	PA.11 / I2C0_SMBSUS / TM0 / DPWM_RP /
	J7.13	61	PA.12 / I2C0_SMBAL / TM0_EXT / SPI2_I2SMCLK
	J7.14	62	PA.13 / CLKO / INT0 / DPWM_SN / I2C1_SCL
	J7.15	63	PA.14 / SPI0_SS0 / TM1 / DPWM_SP / I2C1 / SDA
	J7.16	64	PA.15 / INT0 / TM1_EXT
	J7.17		GND
	J7.18		VDD33
J8	J8.1		GND
	J8.2		VDD33
	J8.3	1	PB.0 / PWM0_SYNC_IN / I2C0_SCL / PWM0_CH0
	J8.4	2	PB.1 / PWM0_SYNC_OUT / I2C0_SDA / PWM0_CH1
	J8.5	3	PB.2 / PWM0_CH0 / TM2 / PWM0_CH2
	J8.6	4	PB.3 / PWM0_CH1 / TM2_EXT / DMIC_DAT1 / UART0_RXD / PWM0_CH3
	J8.7	5	PB.4 / UART0_nCTS / PWM0_CH0 / DMIC_CLK1 / UART0_TXD / PWM0_CH4
	J8.8	6	nRESET
	J8.9		NC
	J8.10		NC
	J8.11	9	PB.7 / UART0_nRTS / PWM0_CH3
	J8.12	10	PB.8 / UART0_TXD / PWM0_CH4
	J8.13	11	PB.9 / UART0_RXD / PWM0_CH5
	J8.14	12	LDO_CAP
	J8.15		GND
	J8.16		GND

Header		NT-I941	
		Pin No.	Function
	J8.17	15	VDD33
	J8.18	16	AVDD33

Table 3-2 NT-I941 Pin Extension Connectors and IO Function List

3.4 Power Supply Configuration

The NT-I941 can be supplied by an external 5V USB power connected to Micro USB connectors (CN1) or ICE 5V from Nu-Link(J1) or 4.5 Volt to 5.0 Volt DC power supply connected to VCC Pin Header (J2). On-board reversed 2 current protection diodes will ensure power can be provided through both USB and ICE connectors at the same time safely. If the board is powered from USB connector, it is not recommended to apply an additional DC power supply to VCC pin header (J2), because there is no protection against reverse current into the DC power supply. Figure 3-4 shows NT-I941 power supply concept.

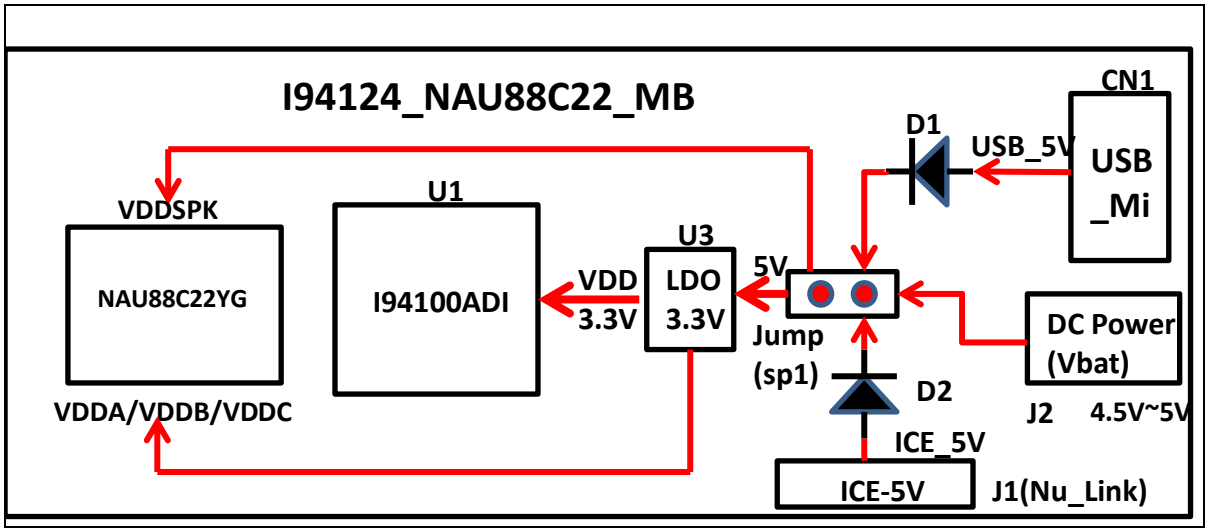


Figure 3-4 Power Supply Block Diagram

3.4.1 5V Power Sources

Table 3-3 presents the 5V power sources.

Connector	Net Name in Schematic	Description
CN1	USB_5V	Power pin on CN1 to supply 5V power from PC Host VBUS.
J1	ICE_5V	Power pin on J1 for the power from Nu-Link (this board requires 5V)
J2	VDD_5V	Power pin of J2 for DC or battery power input

Table 3-3 5V Power Sources

3.4.2 3.3V LDO

The voltage regular U3 converts the 5V source to 3.3V and supplies it to I94124ADI and NAU88C22 on board.

Power Source	Component	Comment
VDD_3V3	U3	LDO output 3.3V to supply I94100 platform board.

Table 3-4 3.3V LDO for VDD_3V3

3.5 Push Buttons

Table 3-5 presents the push buttons.

Component	Description
SW1	Reset button to reset the target chip.
SW2	User button, it is used to control PA.15

Table 3-5 Push Buttons

3.6 LEDs

Table 3-6 presents the LEDs.

Component	Description
D3	Green LED. The power LED indicates that the NT-I941 is powered.
D4	Red LED. Controlled by PB.0

Table 3-6 LEDs

3.7 SPI Flash Connector

Table 3-7 presents the pin function of SPI Flash connector.

Connector	Pin No.	Function
J3	J3.2	SPI0_CLK
	J3.3	SPI0_MOSI0
	J3.4	SPI0_MISO0
	J3.5	SPI0_SS0
	J3.6	nRESET

Table 3-7 SPI Flash Connector

3.8 ICE Connector

The ICE connector is compatible with the Nu-Link series. It is recommended to use the Nu-Link. Table 3-8 presents the pin function of ICE connector.

Connector	Pin No.	Function
J1	J1.2	PD9_ICE_DAT
	J1.3	PD8_ICE_CLK
	J1.4	nRESET

Table 3-8 ICE

3.9 Audio Interfaces

Table 3-9 presents audio interfaces of NAU88C22.

Component	Description
MIC1	Microphone1
MIC2	Microphone2
J12	AUXIN
J13	Headphone out
LS1	Speaker out

Table 3-9 Audio Interfaces

4 QUICK START

4.1 Toolchains Supporting

The Nuvoton Nu-Link series has various models. It is recommended to use the NU-LINK as the ICE debugger and programmer.

Install the preferred toolchain. Please make sure at least one of the toolchains has been installed.

- KEIL MDK Nuvoton edition – Full Cortex-M

4.2 Nuvoton Nu-Link Driver Installation

Download and install the latest Nuvoton Nu-Link Driver.

- Download and install Nu-Link_Keil_Driver when using Keil MDK.

Please install the Nu-Link USB Driver as well at the end of the installation. The installation is presented in Figure 4-1 and Figure 4-2.

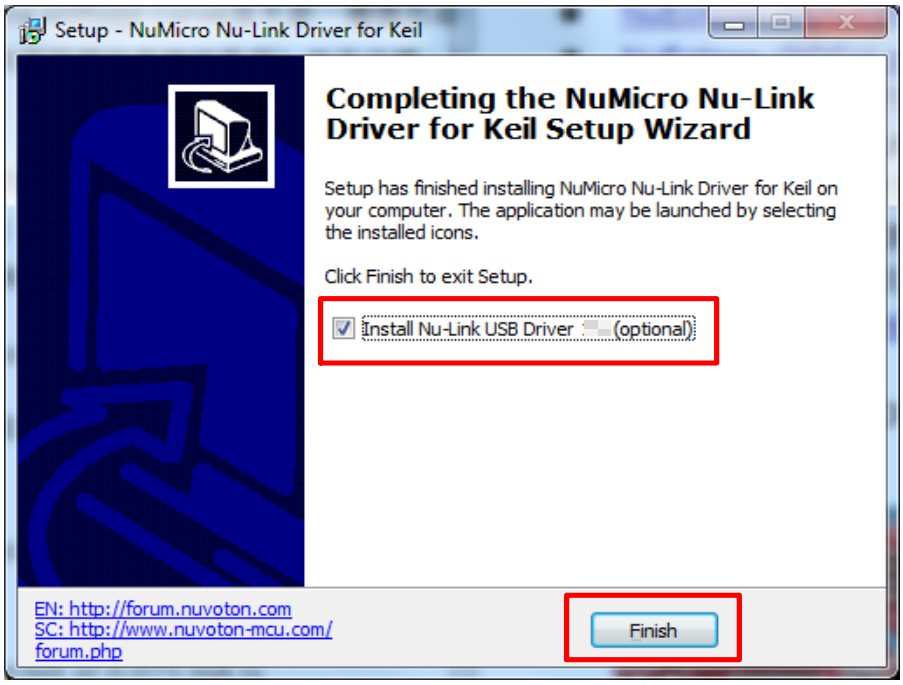


Figure 4-1 Nu-Link USB Driver Installation Setup

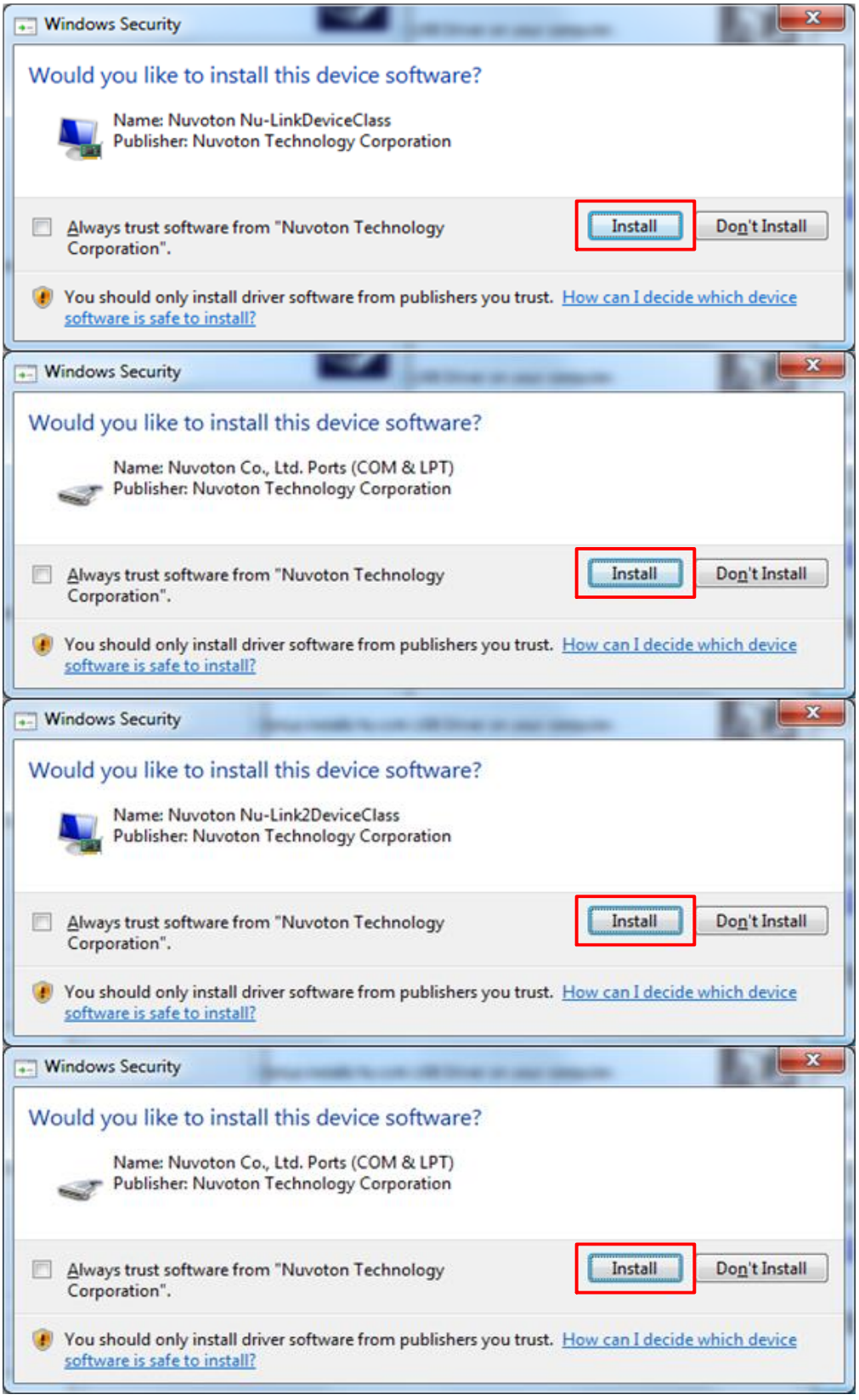


Figure 4-2 Nu-Link USB Driver Installation

4.3 BSP Firmware Download

Download and unzip the Board Support Package (BSP).

4.4 Hardware Setup

The Nu-Link is the ICE debugger and programmer, which enables users to program I94100 and debug their application via the SWD interface.

5 NT-I941 SCHEMATICS

5.1 NT-I941 Schematic Circuit

Figure 5-1 and Figure 5-2 show the NT-I941 circuit.

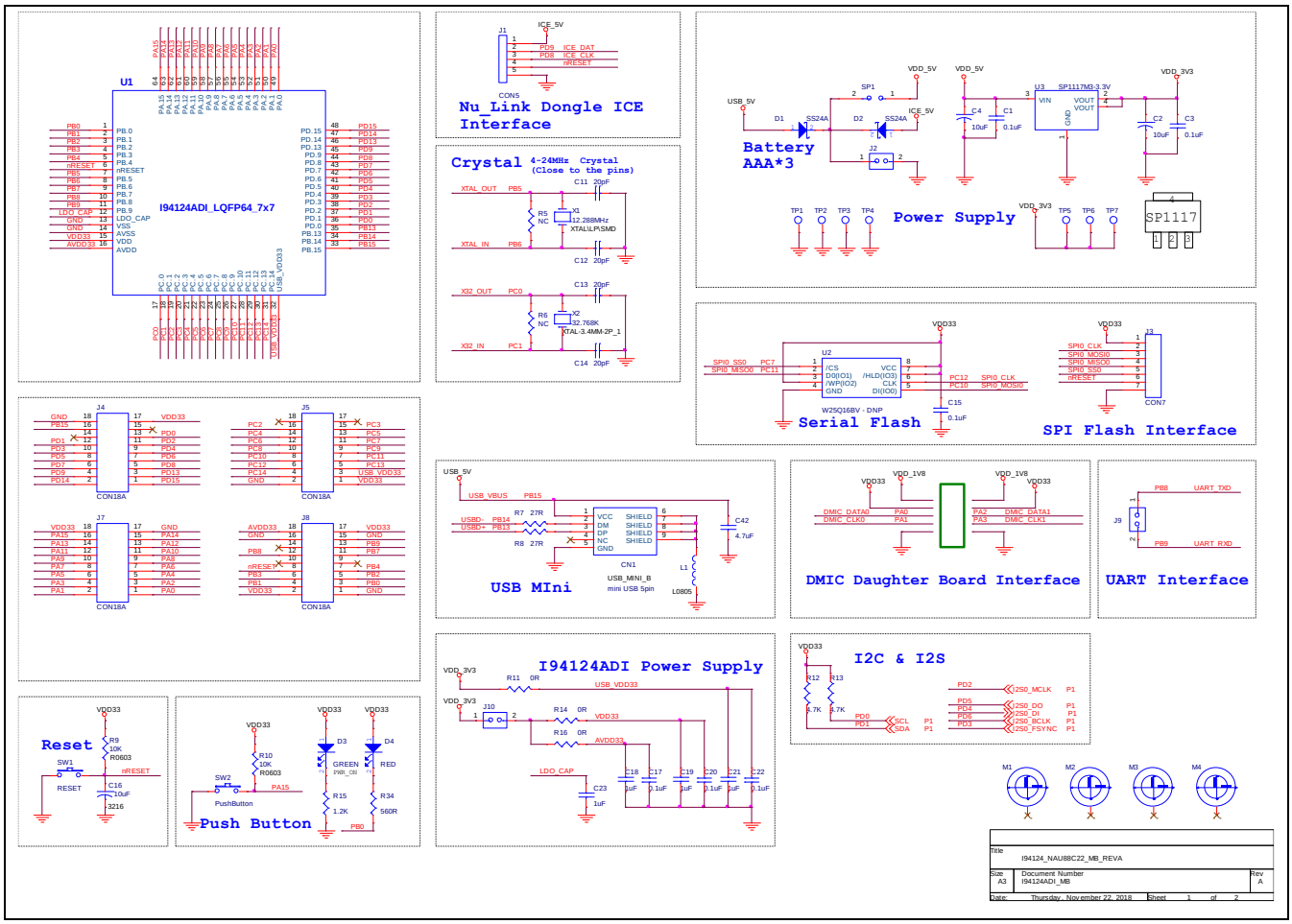


Figure 5-1 NT-I941 Circuit Page 1/2

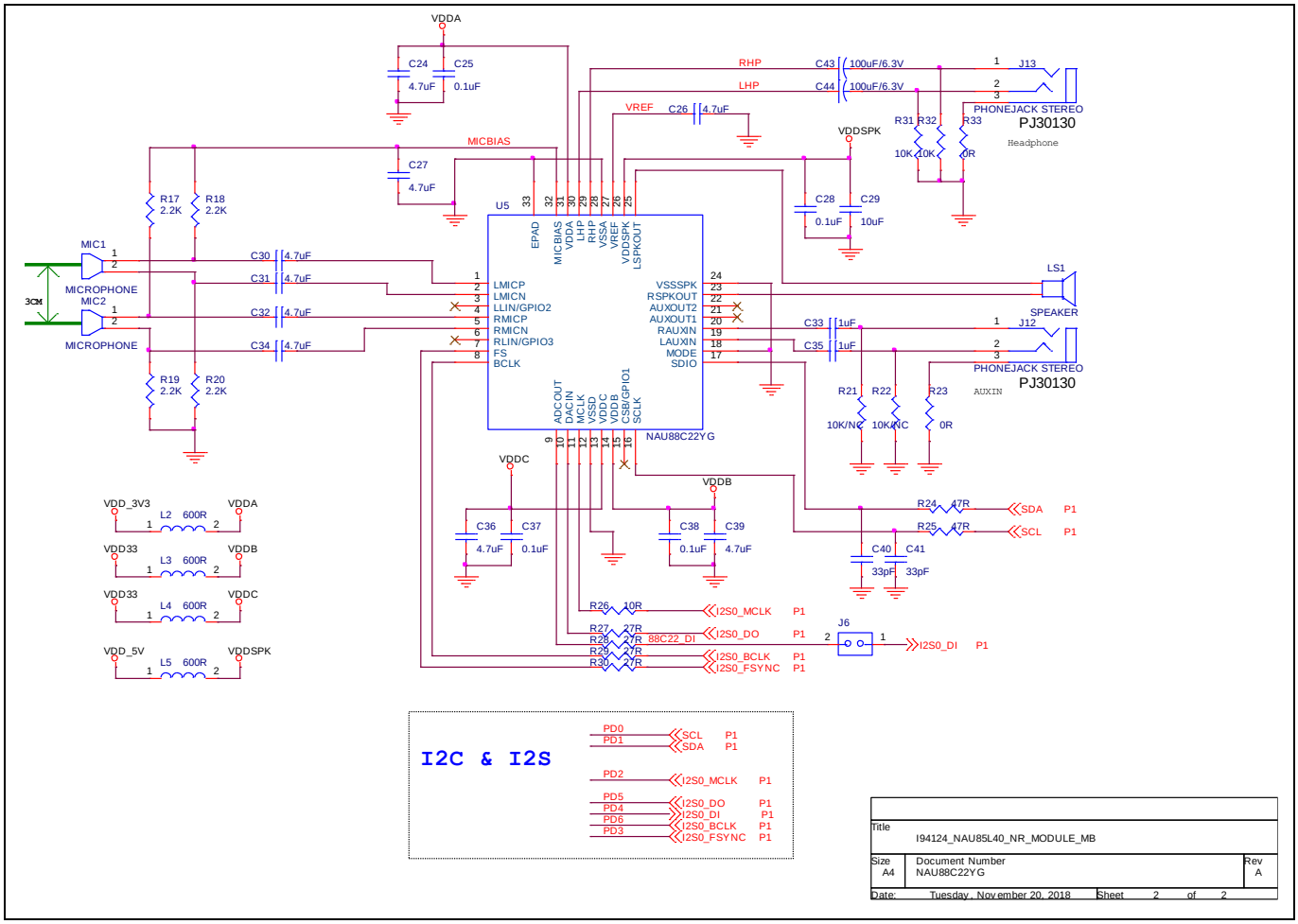


Figure 5-2 NT-I941 Circuit Page 2/2

5.2 PCB Placement

Figure 5-3 shows the front placement of NT-I941.

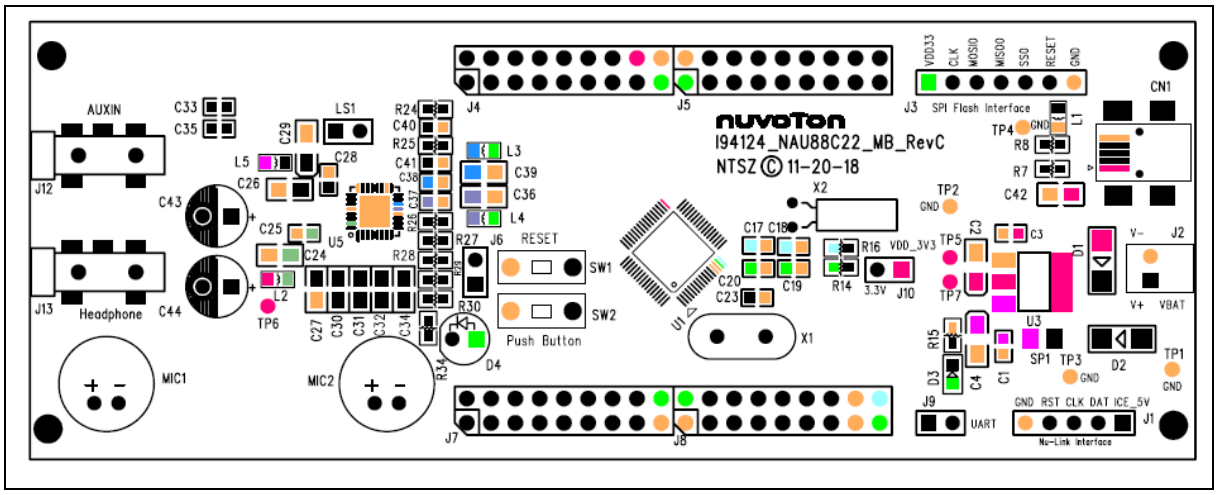


Figure 5-3 Front Placement

Figure 5-4 shows the rear placement of NT-I941.

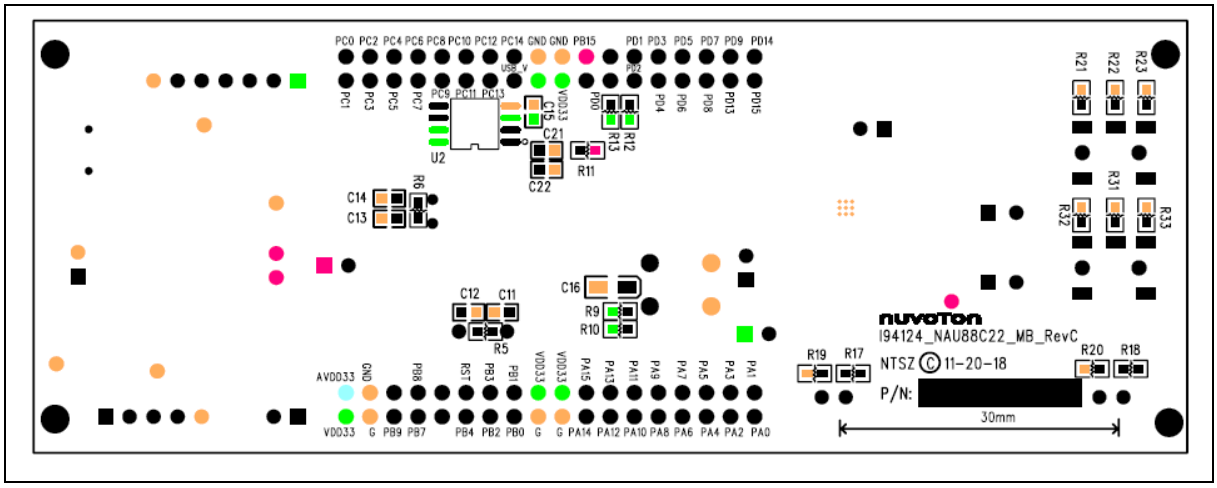


Figure 5-4 Rear Placement

6 REVISION HISTORY

REVISION	DATE	DESCRIPTION
1.0	May. 21, 2025	Initial Release
1.1	Jul. 3, 2025	Modification of series naming rules

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